Texas Instruments

TPS61030EVM-029

Evaluation Module

User's Guide

October 2003

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the specified input and output ranges described in the EVM User's Guide.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, some circuit components may have case temperatures greater than 60°C. The EVM is designed to operate properly with certain components above 60°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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Preface

Read This First

About This Manual

This user's guide describes the characteristics, operation, and use of the TPS61030EVM-029 synchronous boost converter evaluation module (EVM). This EVM features a Texas Instruments high-efficiency, single-cell Li-Ion, dual-cell battery boost converter that is configured to deliver 5.0V at 1A with an input voltage of 1.8V. This user's guide includes setup instructions, a schematic diagram, a bill of materials (BOM), characterization results, and printed circuit board (PCB) layout drawings for the evaluation module.

How to Use This Manual

This document contains the following chapters:

- Chapter 1—Introduction
- Chapter 2—Setup
- Chapter 3—Board Layout
- Chapter 4—Schematic and Bill of Materials

Related Documentation From Texas Instruments

The following document provides information regarding Texas Instruments integrated circuits used in the assembly of the TPS61030EVM-029. This document is available from the TI web site. The last character of the literature number corresponds to the document revision, which is current at the time of the writing of this User's Guide. To obtain a copy of the following TI document, visit our website at http://www.ti.com/ or call the Texas Instruments Literature Response Center at (800) 477−8924 or the Product Information Center at (972) 644−5580. When ordering, identify the document by both title and literature number.

Data sheet	Literature number
TPS61030 Data Sheet	SLUS534

If You Need Assistance

If you have questions regarding either the use of this evaluation module or the information contained in the accompanying documentation, please contact the Texas Instruments Product Information Center at (972) 644−5580, visit the TI web site at www.ti.com, or contact your local TI sales representative.

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This equipment is intended for use in a laboratory test environment only. It generates, uses, and can readiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to subpart J of part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment in other environments may cause interface with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

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Chapter 1

Introduction

The Texas Instruments TPS61030EVM evaluation board helps designers evaluate the operation and performance of the TPS61030 family of high-frequency synchronous boost DC/DC converters.

This EVM is specifically designed and optimized to operate with 2-cell NiCad, Ni-MH, or alkaline battery input. The default output voltage of this EVM is 5.0V. If desired, this EVM can easily be modified to supply higher or lower output voltages by adjusting the appropriate feedback resistor dividers. Also, other fixed-output voltage versions of the devices can be easily evaluated using this EVM. Refer to the TPS61030 data sheet (SLVS534) for the various fixed-output voltage options available in the TPS6103x device family as well as for more information on adjusting the output voltage.

Chapter 2

Setup

This chapter describes the jumpers and connectors on the EVM as well as how to properly configure, set up, and use the TPS61030EM-029.

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2.1 Input/Output Connector Descriptions

2.1.1 J1—VBAT

This is the positive connection to the input power supply. The leads to the input supply should be twisted and kept as short as possible to minimize EMI transmission.

2.1.2 J2—GND

This is the return connection for the input power supply.

2.1.3 J3—VOUT

This is the positive connection from the output of the power supply. Connect this pin to the positive input of the load.

2.1.4 J4—GND

This is the negative connection from the output of the power supply. Connect this pin to the negative input of the load.

2.1.5 J5—LBO

The LBO pin is an open-drain output configured with a 1M pull-up resistor.

2.1.6 J6—GND

This is the ground connection for the LBO pin.

2.1.7 JP1—SYNC

This jumper enables or disables the power save mode at light loads. If SYNC is connected to VBAT, the power save mode is disabled. Connecting SYNC to GND enables the power save mode. When the SYNC pin is not connected to VBAT or GND, the switch of the frequency of the device will synchronize to a user-provided signal of 500kHz to 700kHz.

2.1.8 JP2—EN

This jumper enables and disables the TPS61030 on the EVM.

2.2 Setup

Connect an input supply between J1 and J2. The voltage range on this supply should stay between 1.8V and 5.0V. Connect a load between J3 and J4. Enable the output by positioning a jumper to connect the EN and ON pins. Configure the SYNC jumper to the desired setting.

2.3 Operation

The EVM has been optimized to operate from a 2-cell NiCad, NiMH, and alkaline battery with input voltage range down to 1.8V. The output voltage is set to 5.0V and is capable of supplying 1A. After connecting the input and output connections, and setting the SYNC jumper (JP1) to the desired setting, turn on the input supply and then enable the output as desired with JP2.

The resistor divider on the LBI pin is designed to trip the LBO output when the input supply voltage drops below 1.8V.

Efficiency may vary depending on the inductor used in the design. Generally, smaller size inductors decrease the efficiency in the design. Figure 2−1 shows the efficiency versus I_{OUT} curve for the TPS61030EVM.

Figure 2−1. Efficiency vs I_{OUT} for the TPS61030EVM

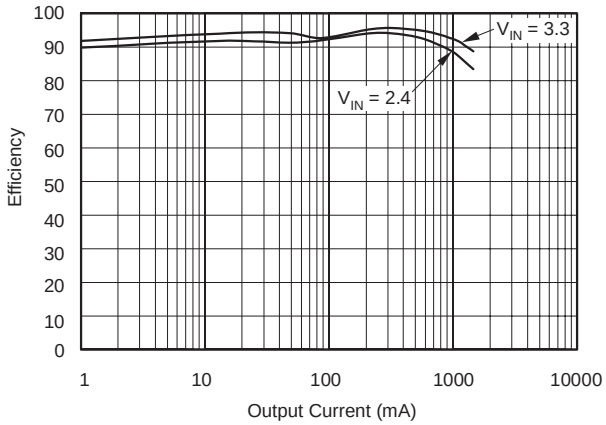
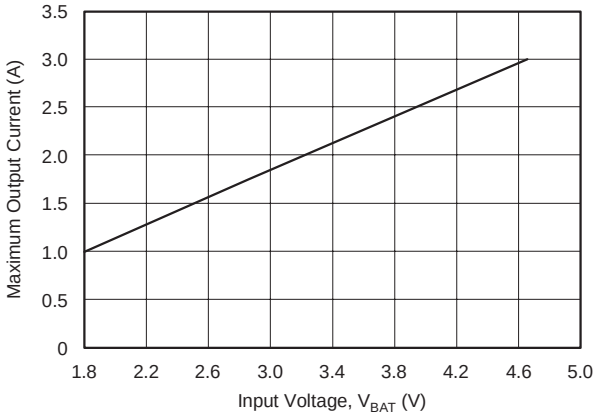


Figure 2−2 shows the typical maximum output current versus input voltage for this EVM.

Figure 2−2. Maximum Output Current vs V_{BAT}



Chapter 3

Board Layout

This chapter provides the TPS61030EVM-029 board layout and illustrations.

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3.1 Layout

Board Layout is critical for all switch mode power supplies. Figure 3−1, Figure 3−2, and Figure 3−3 show the board layout for the TPS61030EVM-029 PCB. The nodes with high switching frequencies and currents are short and isolated from the noise sensitive feedback circuitry. Careful attention has been given to the routing of high-frequency current loops. Refer to the data sheet for specific layout guidelines.

Figure 3−1. Assembly Layer

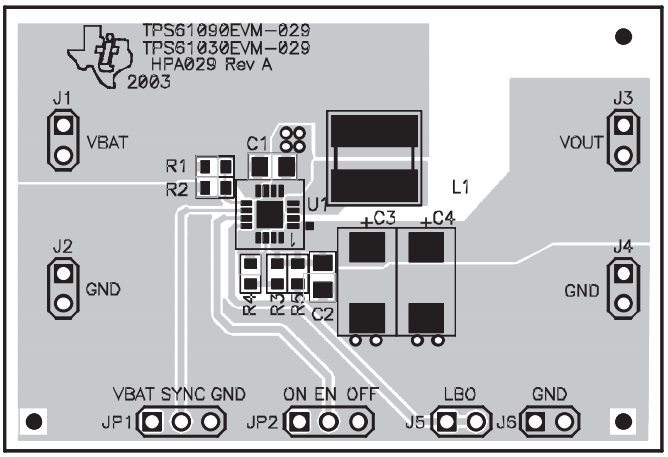


Figure 3−2. Top Layer Routing

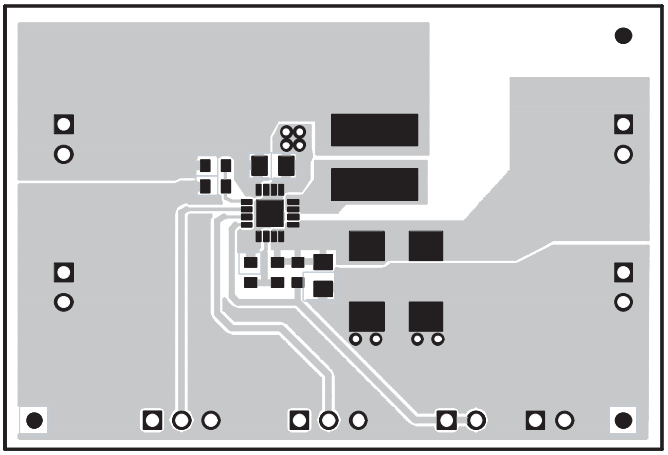
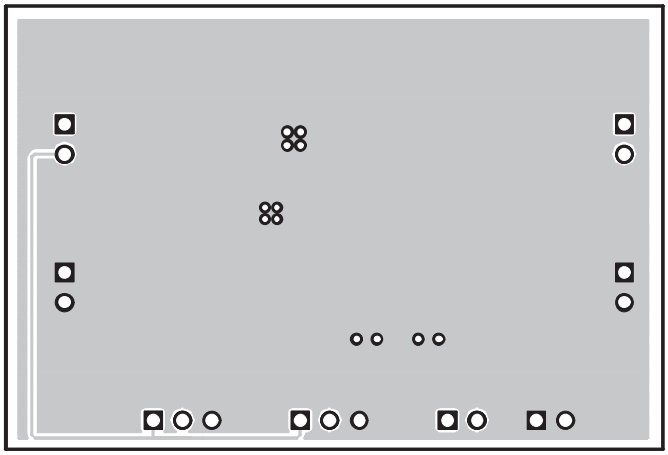


Figure 3−3. Bottom Layer Routing



Chapter 4

Schematic and Bill of Materials

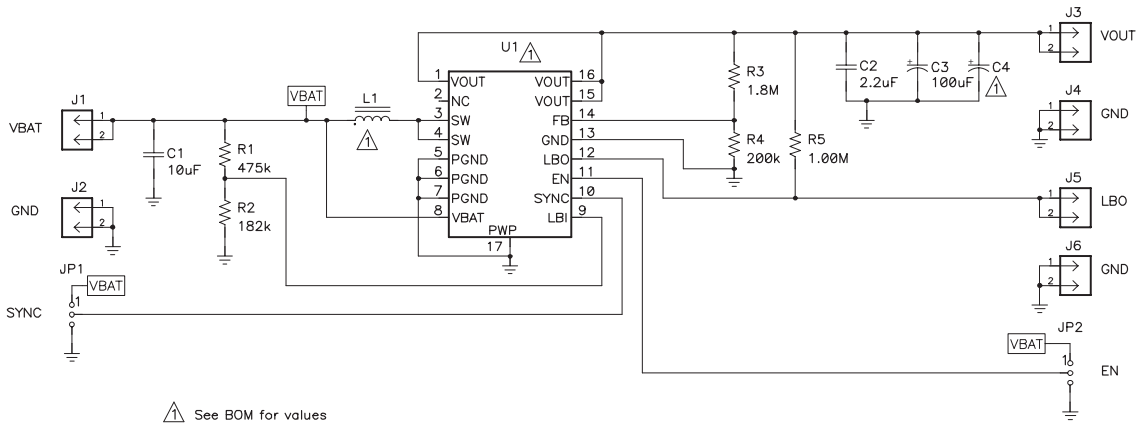
This chapter provides the TPS61030EVM-029 schematic and bill of materials.

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4.1 Schematic

Figure 4−1. TPS61030EVM-029 Schematic



4.2 Bill of Materials

Table 4−1. TPS61030EVM-029 Bill of Materials

Count	Reference Designator	Description	Size	Manufacturer	Mfg Part Number
1	C1	Capacitor, Ceramic, 10µF, 6.3V, X5R, ±10%	805	TDK	C1608X5R1A105KT
1	C2	Capacitor, Ceramic, 2.2µF, 10V, X5R, ±20%	805	TDK	C1005X7R1H472KT
2	C3, C4	Capacitor, Low ESR Tantalum, 100µF, 16V, 270mΩ, 10%	7343 (D)	Vishay	595D107X0016C2T
6	J1−J6	Header, 2-pin, 100 mil spacing (36-pin strip)	0.100 x 2	Sullins	PTC36SAAN
2	JP1, JP2	Header, 3-pin, 100 mil spacing (36-pin strip)	0.100 x 3	Sullins	PTC36SAAN
1	L1	Inductor, SMT, 6.8µH, 4.9A, 23mΩ	0.476 x 0.515	Sumida	CDRH124-6R8
1	R1	Resistor, Chip, 475kΩ, 1/16W, 1%	603	Std	Std
1	R2	Resistor, Chip, 182kΩ, 1/16W, 1%	603	Std	Std
1	R3	Resistor, Chip, 1.8MΩ, 1/16W, 1%	603	Std	Std
1	R4	Resistor, Chip, 200kΩ, 1/16W, 1%	603	Std	Std
1	R6	Resistor, Chip, 1.0MΩ, 1/16W, 1%	603	Std	Std
1	U1	IC, Synchronous Boost Converter with 4A Switch	QFN−16	Texas Instruments	TPS61030RSA
1	−−	PCB, 2.23in x 1.5in x .062in		Any	HPA029
2	−−	Shunt, 100 mil (black)	0.100	3M	929950−00